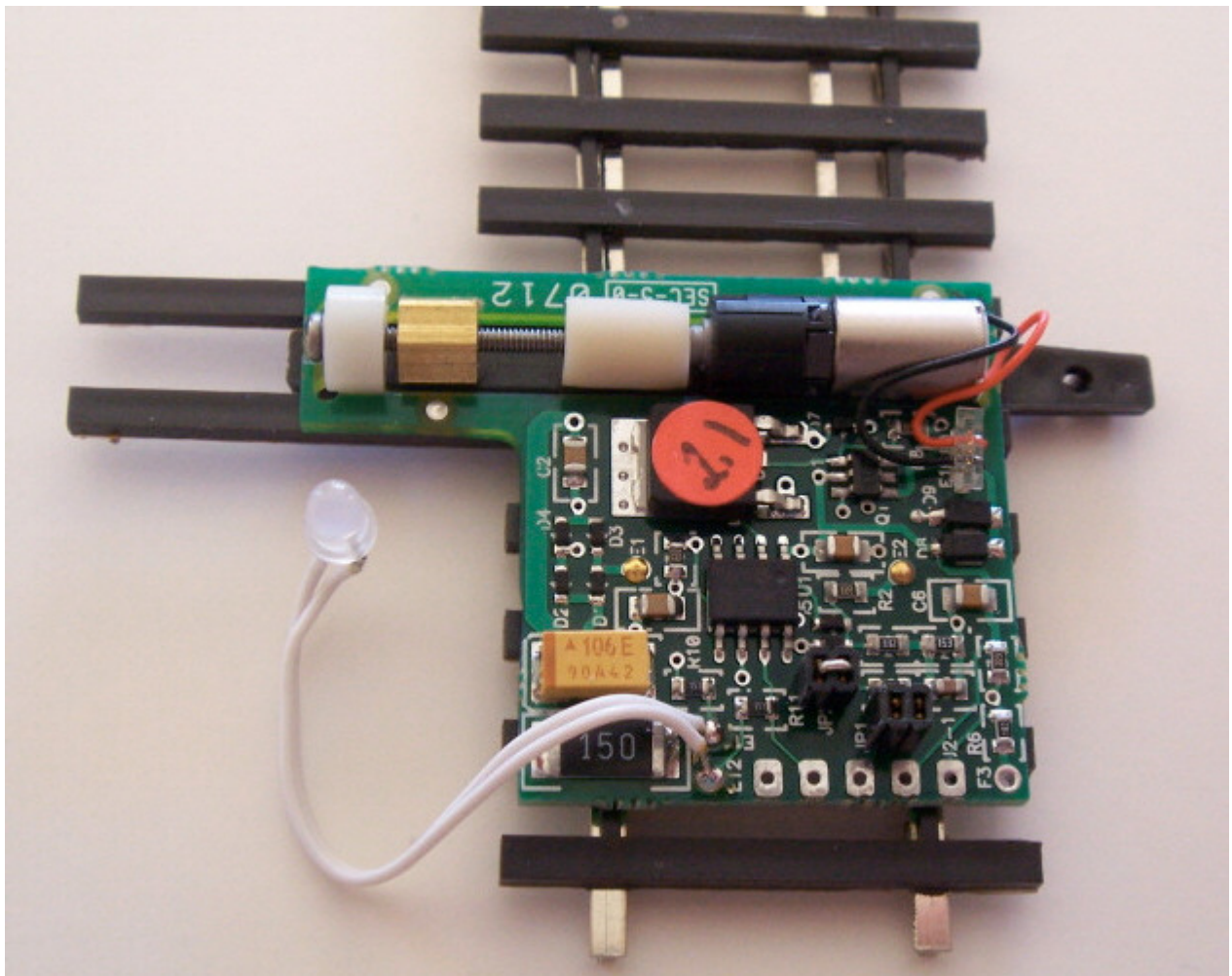




The Flea™ User Manual



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1.0 Introduction

Congratulations on your purchase of a Flea™ switch machine actuator with integral DCC accessory decoder. This is a precision assembly that is factory installed on Walthers® and Peco® code 83 turnouts. The Flea™ incorporates a miniature motor and gearbox that provides smooth, authentic motion during switch transitions. The Flea™ comes in left hand and right hand versions for use with left and right turnouts. A major feature is the absence of under the layout wiring; all that is necessary is to hollow out a small cavity to accommodate the Flea™ in your layout.

The integrated FLEA™ / Code 83 Turnout is a precision mechanism. It should be handled accordingly. Avoid bending or flexing the turnout in any manner. It can cause open circuits in the DCC jumper straps and binding in the points. Larger models such as the double crossover, double slip and large radius curved switches should be held in the middle, never from one end. The motor drive mechanism must be kept free of dirt and debris. This is especially important during ballasting.

The Flea™ is primarily intended as a DCC device but it is also capable of control by a simple SPST toggle switch (not provided). There is also a combination mode where control by both DCC and by a simple SPST pushbutton is provided.

This manual is written for Version 2.2 of the Flea™ software, see the Appendix for a list of changes since version 2.0. The software comes with two options: Option A is for right hand turnouts, it has a default address of 129 and is identified by a red sticker. Option B is for left hand turnouts, it has a default address of 128 and is identified by a blue sticker. The motor turns in opposite directions in the two options. There are no other differences between options A and B. NOTE: On double crossovers and the inner turnout on three way switches, the software is reversed. The red sticker is on the left hand turnouts and the blue sticker is on the right hand turnout. This is due to the way these switches are constructed. The default addresses remain the same for the color of the sticker. The red sticker has a default address of 129 and the blue sticker has a default address of 128.

The Flea™ has a pair of outputs intended to drive a dual LED indicator. A dual red/green indicator is supplied, attached to the Flea™ via a short pair of wires. The LEDs indicate the turnout position; they also provide feedback during programming. One further function of the LEDs is to provide information about the Flea™ immediately following power up. Remote indication of turnout position is possible by extending the LED wires to the desired location.

The Flea™ is capable of being programmed for route operations and can inter-operate with the Hares™ Smart Routes™.

1.1 Addressing

The decoder in the Flea™ has its own address this makes it possible for a DCC command station to send messages uniquely to it. The default address should be changed prior to installation in the layout otherwise more than one Flea™ may respond to each command. After the address has been programmed the Flea™ will permanently remember it until such time as it is changed again. The decoder address in the Flea™ serves two purposes: Not only is it the accessory decoder address where switch Throw and Clear commands are sent but also it is the loco address where programming commands are sent.

When choosing an address for the Flea™ it is important that it be available both as an accessory decoder address and as a four digit loco address to avoid duplication of addresses. The Flea™ does not respond to two digit loco addresses.

The default addresses are 128 and 129. In situations where a turnout requires two Fleas™ one will have Option A software and the other will have Option B. The Flea™ may be programmed to any address in the range 128 to 2000 but check your command station and throttle to determine if the whole range is accommodated.

It is important to keep a record of the decoder address for future use but if the address does become lost it may be read from the LEDs as part of the power up message.

CAUTION: Programming two switches to the same address MUST be avoided. The recovery process requires access to the solder pins on the circuit board or the removal of the switch from the layout. Keep a list of your switches with their addresses. A good idea would be to select a block of addresses for switches, large enough to cover all future needs, and use the next number in succession whenever a new switch is added to the layout. The LED blinks out the address of the switch on power up. This is a very helpful feature to avoid addressing conflicts.

1.2 Power Up Message

Immediately following power up the Flea™ sends a power up message to the Clear and Thrown LEDs. This provides information about the decoder address, the current mode, software version number and software option letter.

First the decoder address is displayed as a series of pulses representing each digit. For example the default address of 128 is displayed as one pulse followed by two pulses followed by eight pulses. A single long pulse is used to represent a zero digit. If the Flea™ is in Toggle Switch mode then the Clear LED is used for this part of the message. If the Flea™ is in DCC mode or Dual mode the Thrown LED is used.

Next the software version is displayed in similar fashion. For example version 2.1 is displayed as two pulses followed by one pulse. The Thrown LED is used for option A and the Clear LED is used for option B.

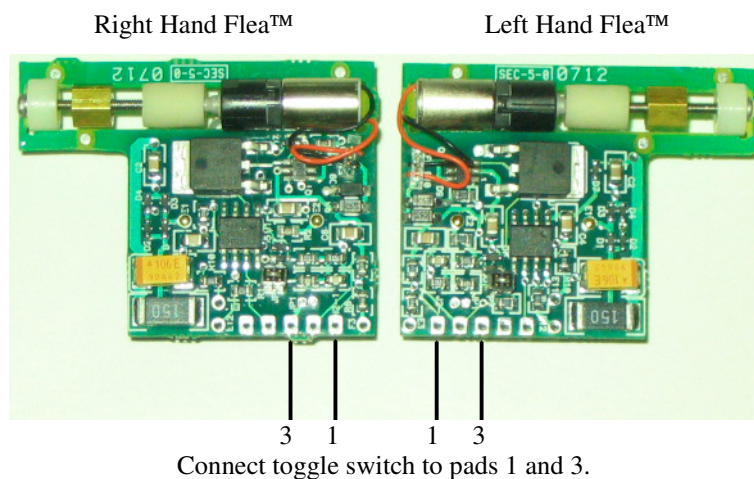
2.0 Operation by Toggle Switch Control

The default mode for the Flea™ is Toggle Switch control. If a toggle switch has been installed and the Flea™ is in Toggle Switch mode then closing the switch will set the turnout into the Clear position and opening the switch will set the turnout into the Thrown position. Since the Flea™ obtains its power from the rails successful operation in Toggle Switch mode still requires the turnout to be installed in a DCC layout.

It is important to note that the Flea™ will still respond to DCC *programming* commands when in Toggle Switch mode. It is strongly recommended to change the address of the Flea™ prior to installation in the layout, otherwise its operation may be modified any time programming commands are issued to the default address.

2.1 Toggle Switch Connection

The following illustration shows the left hand and right hand versions of the Flea™ and identifies where to connect the toggle switch. A simple single pole single throw (SPST) switch is all that is required and it does not matter which way round the connections are made. The wires should be carefully soldered to pads 1 and 3 using an iron with sufficient heat to quickly make the connection without damaging the board. Pad 3 requires extra heat because it is connected to the ground plane.



3.0 Operation by DCC Control

When the Flea™ has been changed to DCC mode it will respond to Accessory Decoder Clear and Throw commands issued to its decoder address. Authentic, prototypical operation is assured by the motor and gearbox actuator. The default mode for the Flea™ is Toggle Switch mode. To change to DCC mode CV63 must be programmed (see section 6).

It is recommended to program the decoder address prior to installation in the layout, the default addresses of 128 and 129 should not be used or unexpected results may arise due to inadvertent programming when the default address is used on a future occasion. See the Appendix for specific operating instructions for some of the popular command stations.

4.0 Dual Operation Using DCC and Pushbutton Control

When the Flea™ has been changed to Dual mode it will respond to Accessory Decoder Clear and Throw commands issued to its decoder address and also to a pushbutton. When the pushbutton is pressed the turnout will change to the alternate position and

remain there until another command is received either from DCC or by another actuation of the pushbutton. The default mode for the Flea™ is Toggle Switch mode. To change to Dual mode CV63 must be programmed (see section 6).

A simple single pole, single throw (SPST) pushbutton is all that is required. It should have normally open contacts. The pushbutton is connected in the same way as a toggle switch, see Section 2.1 on how to do this.

It is recommended to program the decoder address prior to installation in the layout, the default addresses of 128 and 129 should not be used or unexpected results may arise due to inadvertent programming when the default address is used on a future occasion. See the Appendix for specific operating instructions for some of the popular command stations.

5.0 Routes

As well as the main decoder address it is possible to program up to 28 additional addresses that the Flea™ will respond to for the purpose of routing. Unlike the decoder address that serves both as an accessory decoder address and as a loco address, the route addresses function only as accessory decoder addresses. Route addresses may range from 128 to 2000 but check your command station and throttle to determine if the whole range is accommodated. The default addresses of 128 and 129 should be avoided.

By programming the same route address into a number of Fleas™ a single Clear or Throw command issued to the route address will cause each of the Fleas™ in the route to carry out the command. Each Fleas'™ response to the command is determined by its action value for that particular route.

5.1 Route Action Values

To facilitate desired route setting each route in each Flea™ may have its own action value, this determines what action to take in response to Clear and Throw commands sent to a route address.

Action values have four possible settings as described in the following table.

VALUE	RESPONSE TO A CLEAR COMMAND	RESPONSE TO A THROW COMMAND
0	CLEAR	THROWN
1	THROWN	CLEAR
2	THROWN	THROWN
3	CLEAR	CLEAR

5.2 Route Time Delay

An additional feature of the Flea™, when being controlled as part of a route is that each Flea™ introduces a random time delay following a command before that command is carried out. This is to help avoid having all Flea™ motors drawing current at the same time and placing a heavier burden on the power supply. The random time delay is between 0 and 10 seconds.

6.0 Programming

Programming the Flea™ involves setting the values of Configuration Variables (usually referred to as CVs). It is important to note that all programming of the Flea™ is done to the four digit loco address in Ops mode. See the Appendix for specific operating instructions for some of the popular command stations.

Each time a configuration variable accepts a programmed value the Clear and Thrown LEDs are pulsed to indicate success of the programming operation.

6.1 CV16 CV17 CV18

These three configuration variables are used to program the decoders' address. The three CVs must be programmed in order as follows:

- Set CV16 to 0
- Set CV17 to the upper two digits of the four digit decoder address
- Set CV18 to the lower two digits of the four digit decoder address

For example, to program the address 0257 set CV16 = 0, CV17 = 02 (or just 2 will do), CV18 = 57.

Any time a mistake is made simply start over with CV16.

6.2 CV63

There are three possible values for this configuration variable. Programming a value of 53 will change the Flea™ to DCC mode. In this mode the toggle switch is ignored. Programming a value of 42 will return the Flea™ to factory defaults and any prior programming will be lost. The factory default mode is Toggle Switch mode. The Clear and Thrown LEDs are pulsed four times to indicate the Flea™ has been successfully returned to factory defaults. Programming a value of 31 will change the Flea™ to Dual mode. In this mode the Flea™ will respond to both DCC commands and pushbutton commands.

6.3 CV49

There are two possible values for this configuration variable. Programming a value of 1 will cause the Flea™ motor to turn in the opposite direction to normal in response to accessory decoder Clear and Throw commands. Programming a value of 0 will return the motor to normal operation. This configuration variable would be changed if the position of the turnout in response to Clear and Throw commands were the opposite of the desired position.

7.0 Route Programming

The Flea™ may be programmed with up to 28 route addresses and corresponding action values. The routes are numbered 1 through 28. Action values have a range of 0 – 3 and a default of zero. Any action value may be left unprogrammed if desired.

7.1 CV16 CV17 CV18 (Route Address Without Action Value)

These three configuration variables are used to program a route address while leaving the action value unchanged. The three CVs must be programmed in order as follows:

- a) Set CV16 to the route number (1 – 28)
- b) Set CV17 to the upper two digits of the four digit route address
- c) Set CV18 to the lower two digits of the four digit route address

For example, to program the address 0468 into route 9 set CV16 = 9, CV17 = 04 (or just 4 will do), CV18 = 68.

Any time a mistake is made simply start over with CV16.

7.2 CV16 CV17 CV18 CV19 (Route Address With Action Value)

These four configuration variables are used to program route addresses together with associated action values. The four CVs must be programmed in order as follows:

- a) Set CV16 to the route number (1 – 28)
- b) Set CV17 to the upper two digits of the four digit route address
- c) Set CV18 to the lower two digits of the four digit route address
- d) Set CV19 to the action value (0 – 3)

For example to program the address 1234 into route 6 with an action value of 2 set CV16 = 6, CV17 = 12, CV18 = 34, CV19 = 2

Any time a mistake is made simply start over with CV16.

APPENDIX 1 – Digitrax DT400 Throttle Operation

1 Programming Configuration Variables (CVs)

Press [EXIT][LOCO]
Display shows something similar to this.

```
Stat ` 128'
SEL Lo0128
```

Use keypad to enter the address of the
Flea™ to be controlled: [3][4][5]

```
Stat ` 128'
SEL Lo0345
```

Press [PROG] repeatedly until Po shows
On the bottom line

```
Ad2   = ???
CVNo Po0345
```

Using the left hand throttle set the
number of the CV to be programmed: [63]

```
063   = ???
CVNo Po0345
```

Using the right hand throttle set the
value for the CV to be programmed: [53]

```
063   = 053
CVNo Po0345
```

Press [ENTER] and observe the LEDs
blink as the command is accepted

```
063   = 053
CVNo Po0345
```

2 Sending Clear and Throw Commands to the Flea™

Press [EXIT] [SWCH]
Display shows something similar to this.

```
SW     128=t
SEL    SwSEL
```

Use keypad to enter the address of the
Flea™ to be controlled: [3][4][5]

```
SW     345=t
SEL    SwSEL
```

Press [c] or [t] as desired: [c]
The command is sent to the Flea™

```
SW     345=c
SEL    SwSEL
```

APPENDIX 2 – NCE Procab operation

1. Programming Configuration Variables (CVs)

Press [PROG/ESC]	SEL MODE 12:47PM
Display shows something similar to this.	PROGRAM ON THE MAIN
Press [ENTER]	OPS PROG 12:57PM
Display shows something similar to this.	PROG LOCO:_128
Use keypad to enter the address of the Flea™ to be controlled: [3][4][5]	OPS PROG 12:57PM
	PROG LOCO:_345
Press [ENTER]	OPS PROG 12:57PM
Display shows something similar to this.	1=ADR 2=CV 3=CFG
Press [2]	PROG CV 12:57PM
Display shows something similar to this.	ENTER CV NUM:
Use the keypad to set the <i>number</i> of the CV to be programmed: [6][3]	PROG CV 12:57PM
	ENTER CV NUM:63
Press [ENTER]	PROG CV 12:57PM
Display shows something similar to this.	ENTER VALUE:
Use the keypad to set the <i>value</i> for the CV to be programmed: [5][3]	PROG CV 12:57PM
	ENTER VALUE:53
Press [ENTER] and observe the LEDs	PROG CV 12:57PM
Blink as the command is accepted	ENTER CV NUM:
Press [PROG/ESC] to exit.	

2. Sending Clear and Throw Commands to the Flea™

Press [SELECT ACCY]	CONTROL 11:50
Display shows something similar to this.	ACC NUMBER: 128
Use keypad to enter address of the Flea™ to be controlled: [3][4][5]	ACC: 345 11:50
Press [ENTER]	1=N (ON) 2=R (OFF)
Press [1] or [2] as desired: [1]	ACC: 345 11:50
(1= Clear and 2=Throw)	1=N (ON) 2=R (OFF)
The command is sent to the Flea™	

APPENDIX 3 – MRC Operation

1. Programming Configuration Variables (CVs)

Press [PROG] twice. Display shows something similar to this.	Prog	Main Track
Press [ENTER] Display shows something similar to this.	Loco 0128	Main Track
Use keypad to enter the address of the Flea [™] to be controlled: [3][4][5]	Loco _345	Main Track
Repeatedly press [ENTER] until CV# shows on the upper line.	CV# _ _ _	Main Track
Using the keypad set the <i>number</i> of the CV to be programmed: [6][3]	CV# _ 63	Main Track
Press [ENTER] Display shows something similar to this.	CV _ _ _ Data	Main Track
Using the keypad set the <i>value</i> for the CV to be programmed: [5][3]	CV _ 53	Main Data Track
Press [ENTER] and observe the LEDs blink as the command is accepted.	CV _ 53	Main Data Track

2. Sending Clear and Throw Commands to the Flea[™]

Press [ACCY]	Accy _ _ _
Use the keypad to enter the address of the Flea [™] to be controlled: [2][4][5] Address can only be between 128 and 255.	Accy 245
Press [ENTER] Display shows something similar to this.	Accy 1or2 245
Press [1] or [2] as desired: [2] 1=Clear and 2=Throw The command is sent to the Flea [™]	Accy OFF 245

Appendix 4 – Software Revisions

REVISION	CHANGES
2.0	Initial release of this version
2.1	Power up message added (see section 2.1)
2.2	Dual mode added (see section 4.0)